

2014 Annual Toxicology Report

Department of Justice
Forensic Science Division
Toxicology Section



2679 Palmer Street
Missoula, MT 59808
DOJTOX@mt.gov

Personnel

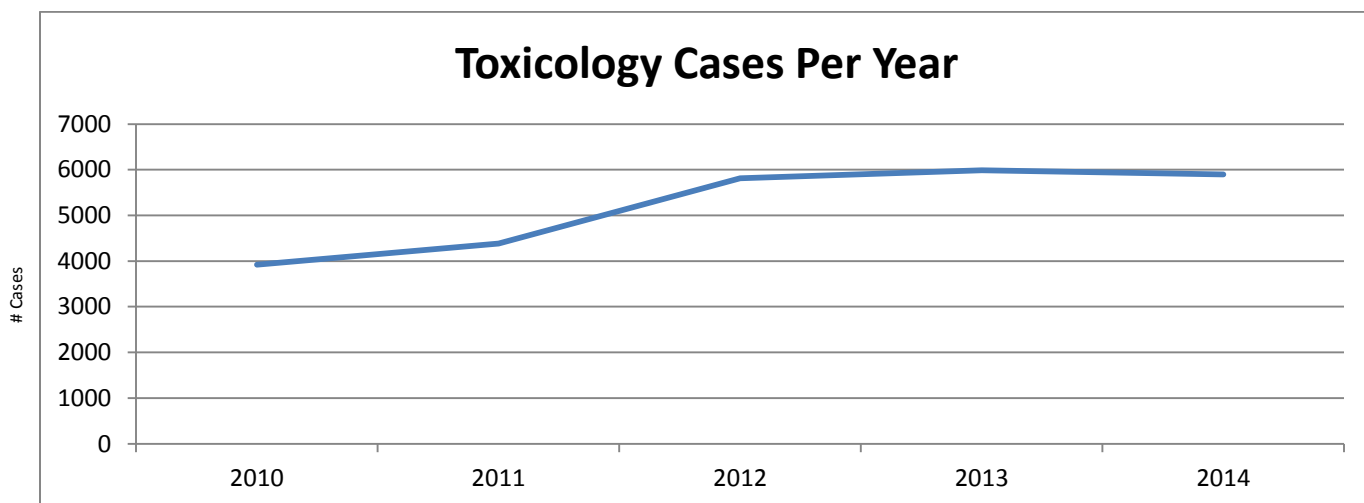
Phil Kinsey, Laboratory Administrator	Michelle Duffus, Forensic Toxicologist
Scott Larson, Toxicology Supervisor	Eric Miller, Forensic Toxicologist
Scott Schlueter, Forensic Toxicologist	Doug Lancon, Forensic Toxicologist
Lynn Kurtz, Forensic Toxicologist	Ben Vetter, Breath Alcohol Manager
Beth Smalley, Forensic Toxicologist	Crystal Gurney, Toxicology Technician
Sarah Braseth, Forensic Toxicologist	Marley Striebel, Work-Study Student

Introduction

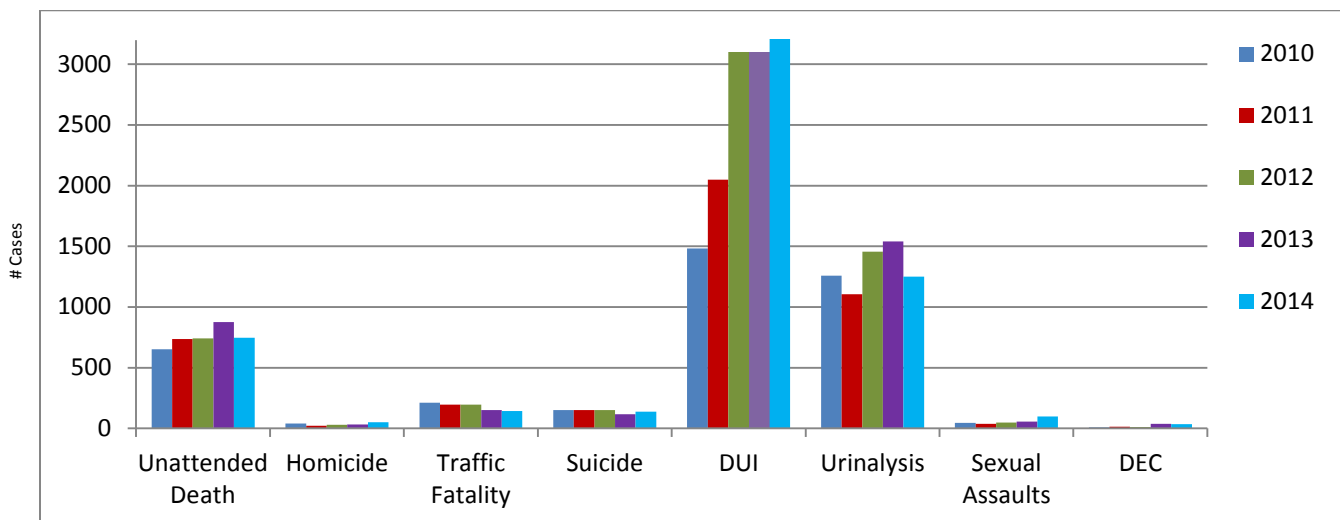
The mission of the Forensic Science Division Toxicology laboratory is to provide the state of Montana forensically defensible results in the quickest timeframe possible. The laboratory provides drug and alcohol testing in driving under the influence cases (DUI or DUID). In addition, our testing results assist the medical examiner/coroner system's determination of cause/manner of death. The cases in this report are sorted in groups as they were submitted to us, not necessarily as the final cause/manner of death as concluded by the medical examiner or coroner. We also perform testing for the Department of Corrections probation/parole system, drug facilitated sexual assault, and drug endangered children cases (DEC). The laboratory continues to follow guidelines needed to sustain ASCLD/LAB accreditation. The laboratory communicates with medical examiners, coroners, law enforcement officials, attorneys, and the general community in matters pertaining to chain-of-custody, pharmacology, and toxicological related matters.

This report contains graphs and figures that can be used to track our results by the many agencies we work in partnership with throughout the state. This is not an exhaustive list of drugs detected and confirmed by this laboratory, just the most frequently found drugs.

Total Testing Per Year



2010-2014 Toxicology Results



2010-2014 Toxicology Results

<u>Total Cases</u>	<u>Unattended Death</u> (Postmortem Cases)	<u>Homicide</u> (Postmortem Cases)	<u>Traffic Fatality</u> (Postmortem Cases)	<u>Suicide</u> (Postmortem Cases)	<u>DUI</u>	<u>Urinalysis</u>	<u>Sexual Assaults</u>	<u>DEC</u>
2010	652	39	212	152	1481	1259	45	9
2011	736	22	196	151	2048	1104	37	13
2012	741	30	195	152	3102	1457	49	12
2013	877	33	151	117	3099	1539	57	37
2014	747	51	200	137	3168	1250	97	35

2014 TURN-AROUND TIME SUMMARY

A standard metric within the toxicology field is determining the number of days needed to complete 95% of the cases. The goal at this laboratory is to complete 95% of the postmortem and DUI Drugs cases within 60 days, 95% of the DUI Ethanol cases within 20 days and 95% of the Urinalysis cases within 30 days. The results of every laboratory depend on the efficiency of the program in general and resources available to the laboratory.

<u>Type of Case</u>	<u>Mean</u>	<u>% of cases within desired range</u>
Postmortem	33 days	91% cases within 60 days
DUI Drugs	51 days	71% cases within 60 days
DUI Ethanol	17 days	67% cases within 20 days
Urinalysis	31 days	51% cases within 30 days

Driving Under the Influence (Alcohol and/or Drugs) Summary

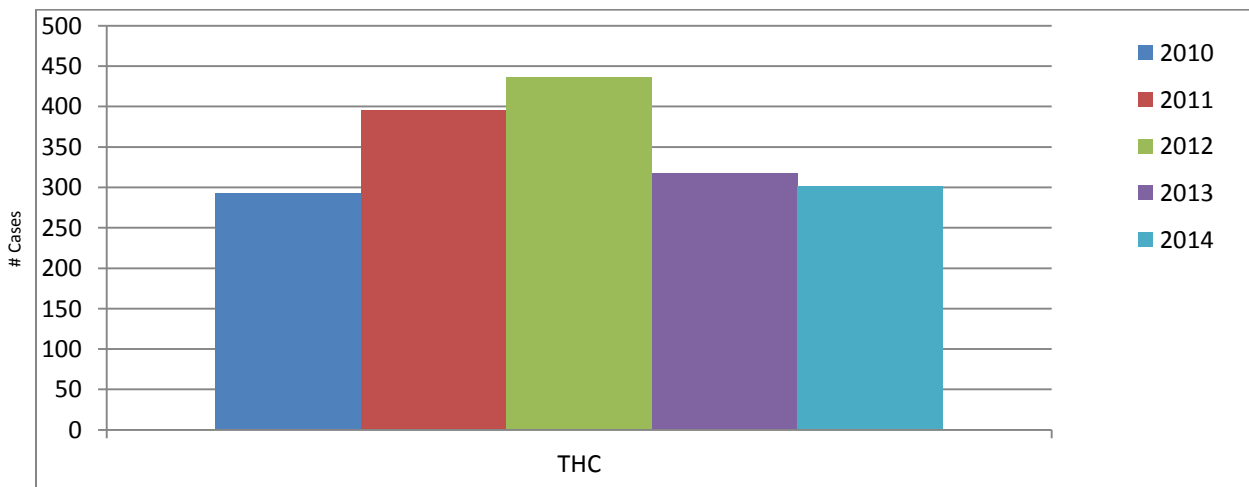
In 2013, a laboratory policy was instituted where drugs were only tested in DUI cases *if* the blood alcohol was less than 0.1 g/100mL. Case reports are then released with a note stating that no drug testing was performed. Contact information is provided if a client requests drug testing to be performed on that case. This policy was necessary to cope with the increased workloads and to reduce delays in the completion of reports for the majority of DUI cases. In 2014, this policy affected 426 cases. Any case involving a drug recognition expert (DRE) is exempt from this policy.

DUI- Alcohol

Alcohol Concentration

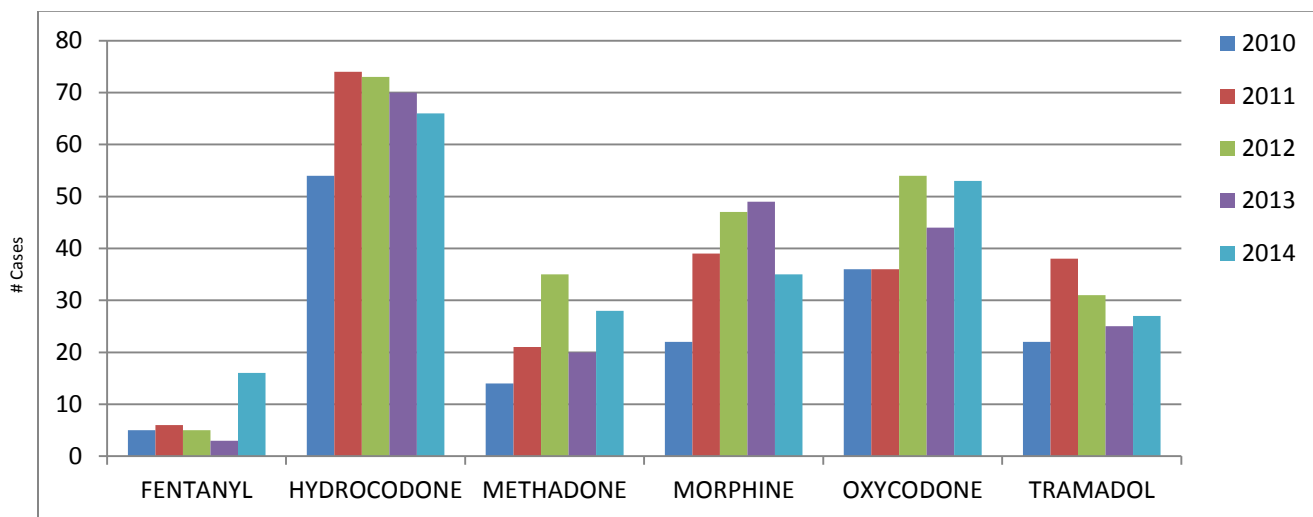
Cases with Alcohol only detected (DUI)	Total	Mean	Range
2010	510	0.18	0-0.43
2011	832	0.19	0-0.45
2012	1653	0.19	0-0.39
2013	1854	0.19	0-0.43
2014	2195	0.19	0-0.46
Cases with Drugs and Alcohol detected (DUID)	Total	Mean	Range
2010	348	0.13	0.02-0.37
2011	496	0.14	0.02-0.46
2012	676	0.14	0.02-0.44
2013	414	0.13	0.02-0.47
2014	259	0.08	0.02-0.40
Combined DUI/DUID Cases	Total	Mean	Range
2010	858	0.16	0-0.43
2011	1328	0.17	0-0.46
2012	2329	0.17	0-0.44
2013	2268	0.18	0-0.47
2014	2454	0.17	0-0.46

DUI- THC



Year	(ng/mL)	THC
2010	Mean	8
	Range	1-68
2011	Mean	7
	Range	1-84
2012	Mean	6
	Range	1-49
2013	Mean	8
	Range	1-48
2014	Mean	11
	Range	1-100

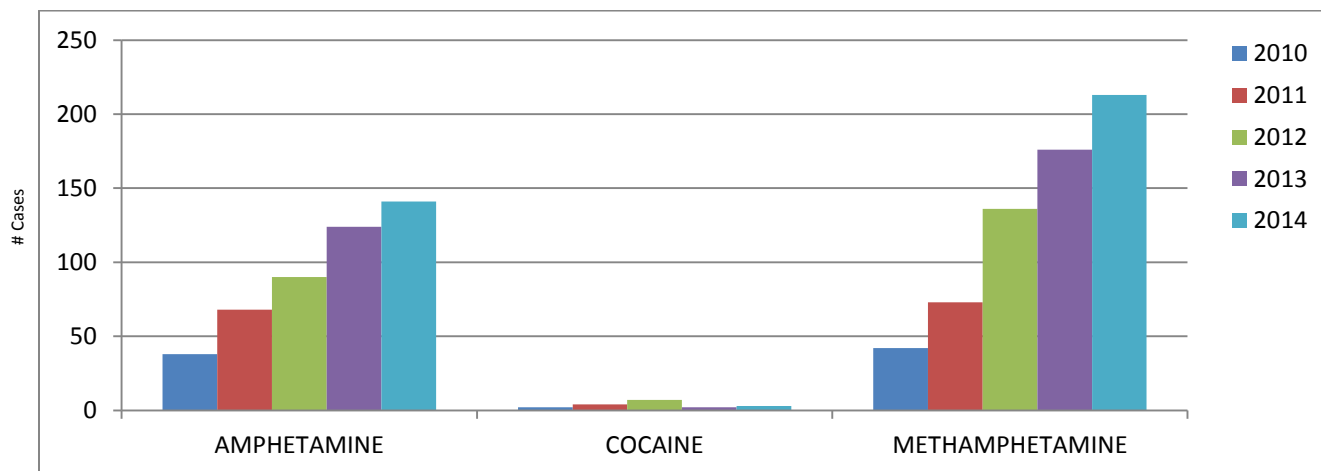
DUI- Narcotic Analgesics



Year	mg/L	FENTANYL*	HYDROCODONE	METHADONE	MORPHINE	OXYCODONE	TRAMADOL
2010	Mean	3.4	0.06	0.15	0.10	0.10	0.41
	Range	2-6	0.02-0.18	0.03-0.39	0.02-0.56	0.02-0.41	0.02-3.1
2011	Mean	3.4	0.06	0.21	0.05	0.23	0.43
	Range	2-5	0.02-0.21	0.02-0.70	0.02-0.13	0.02-1.9	0.02-3.5
2012	Mean	4.3	0.07	0.23	0.06	0.09	1.1
	Range	4-5	0.02-0.6	0.02-0.92	0.02-0.19	0.02-0.41	0.02-10
2013	Mean	---	0.07	0.19	0.05	0.10	0.67
	Range	---	0.02-0.25	0.04-0.79	0.02-0.14	0.02-0.51	0.03-3.4
2014	Mean	2.7	0.07	0.27	0.05	0.10	0.69
	Range	0.69-9.5	0.03-0.2	0.03-0.64	0.02-0.15	0.02-0.29	0.02-3.3

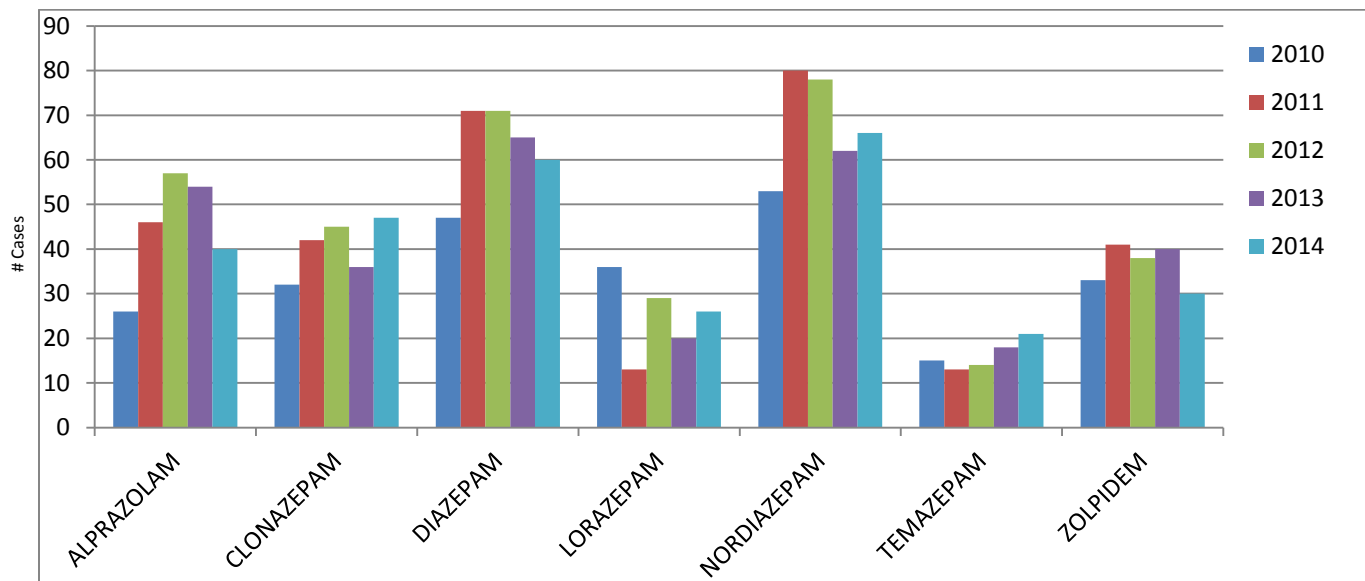
*All concentrations are in mg/L except Fentanyl which is in ng/mL

DUI- Central Nervous System Stimulants



Year	mg/L	AMPHETAMINE	COCAINE	METHAMPHETAMINE
2010	Mean	0.06	<0.02	0.32
	Range	0.02-0.14	<0.02	0.03-1.1
2011	Mean	0.06	0.07	0.22
	Range	0.02-0.38	<0.02-0.07	0.02-1.3
2012	Mean	0.09	0.03	0.30
	Range	0.02-1.0	<0.02-0.03	0.02-4.3
2013	Mean	0.07	0.03	0.26
	Range	0.02-0.28	<0.02-0.04	0.02-2.0
2014	Mean	0.07	NA	0.33
	Range	0.02-0.80	NA	0.02-1.9

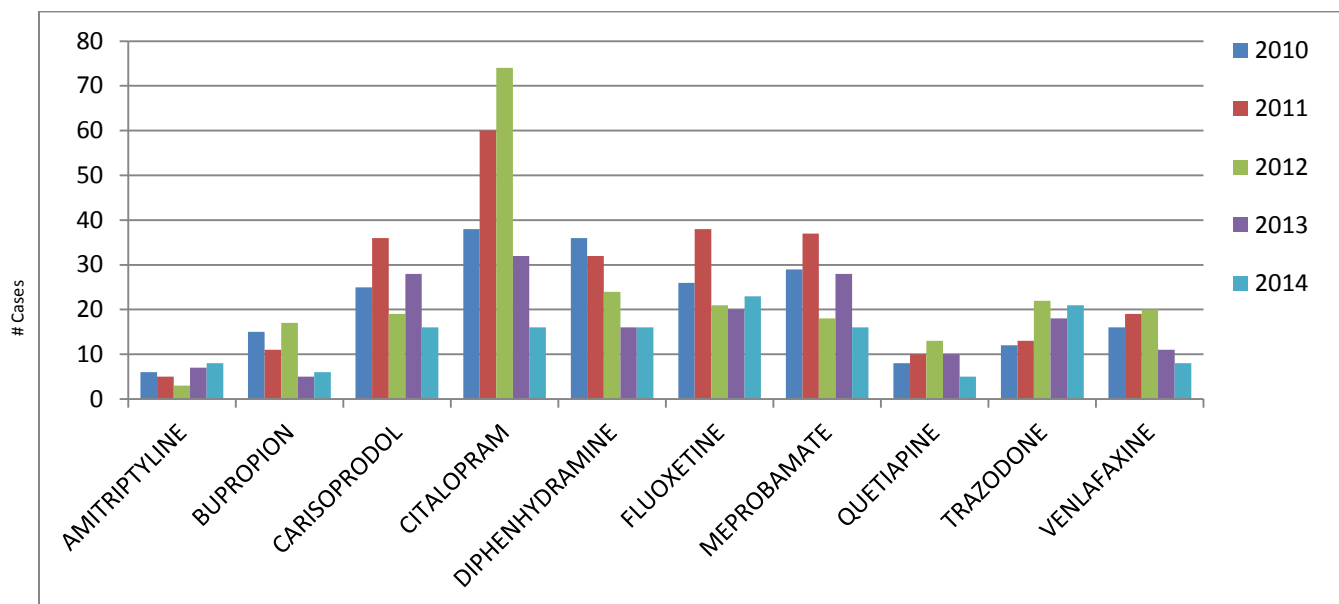
DUI- Central Nervous System Depressants (Benzodiazepines)



Year	mg/L	ALPRAZOLAM	CLONAZEPAM	DIAZEPAM	LORAZEPAM *	NORDIAZEPAM	TEMAZEPAM	ZOLPIDEM
2010	Mean	0.06	0.04	0.38	76	0.39	0.13	0.21
	Range	0.02-0.15	0.02-0.13	0.02-1.7	6-435	0.02-2.5	0.05-0.37	0.02-0.86
2011	Mean	0.09	0.06	0.35	82	0.35	0.33	0.37
	Range	0.02-0.44	0.02-0.17	0.02-3.4	7-201	0.02-3.6	0.06-0.15	0.02-2.7
2012	Mean	0.10	0.07	0.29	58	0.30	0.16	0.40
	Range	0.02-0.26	0.02-0.20	0.02-1.6	5-159	0.02-2.3	0.02-1.1	0.02-3.5
2013	Mean	0.13	0.05	0.54	54	0.40	0.36	0.21
	Range	0.02-0.88	0.02-0.14	0.02-4.6	6-194	0.02-1.7	0.03-0.93	0.02-0.69
2014	Mean	0.09	0.05	0.28	72	0.29	0.25	0.29
	Range	0.02-0.60	0.02-0.19	0.02-1.2	63-200	0.02-2.2	0.02-1.7	0.03-1.3

*All concentrations are in mg/L except Lorazepam which is in ng/mL

DUI- Central Nervous System Depressants



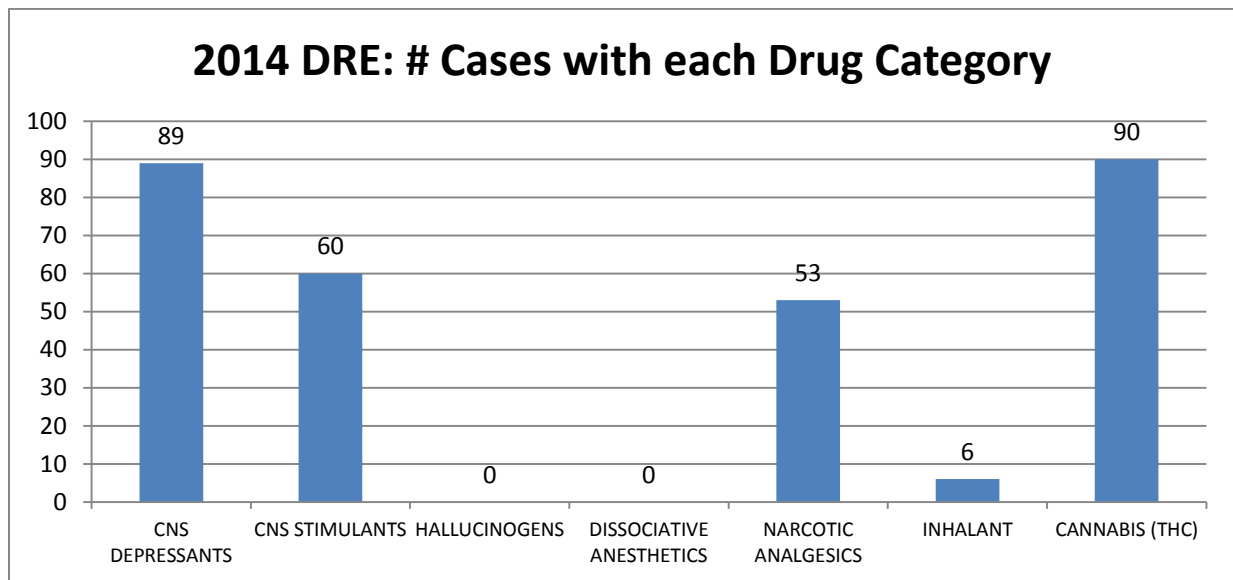
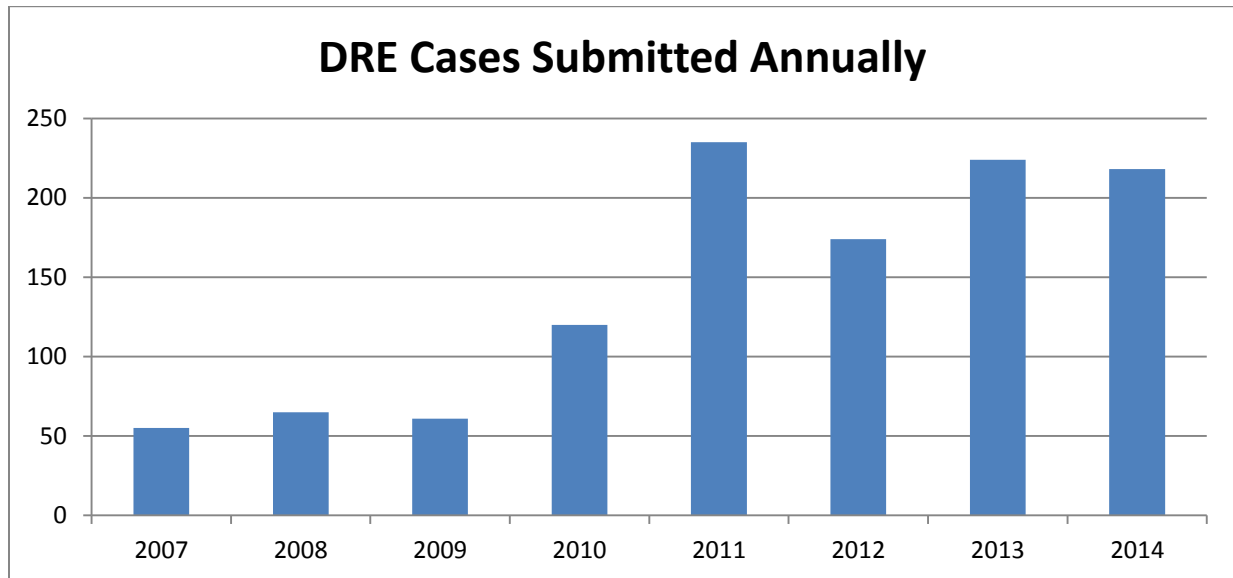
Year	mg/L	AMITRIPTYLENE	BUPROPION	CARISOPRODOL	CITALOPRAM	DIPHENHYDRAMINE
2010	Mean	0.23	0.05	5.4	0.10	0.13
	Range	0.02-0.82	0.02-0.12	2.0-12	0.02-0.32	0.02-0.99
2011	Mean	0.07	0.04	6.7	0.14	0.24
	Range	0.03-0.13	0.02-0.06	2.0-16	0.02-0.67	0.02-1.4
2012	Mean	0.11	0.04	5.4	0.13	0.23
	Range	0.07-0.14	0.02-0.08	2.0-10	0.02-0.48	0.03-1.1
2013	Mean	0.14	0.03	6.4	0.13	0.54
	Range	0.07-0.21	0.03-0.04	2.5-13	0.04-0.46	0.53-2.2
2014	Mean	0.06	0.03	5.1	0.10	0.37
	Range	0.02-0.12	0.02-0.05	2.0-15	0.04-0.21	0.02-2.7

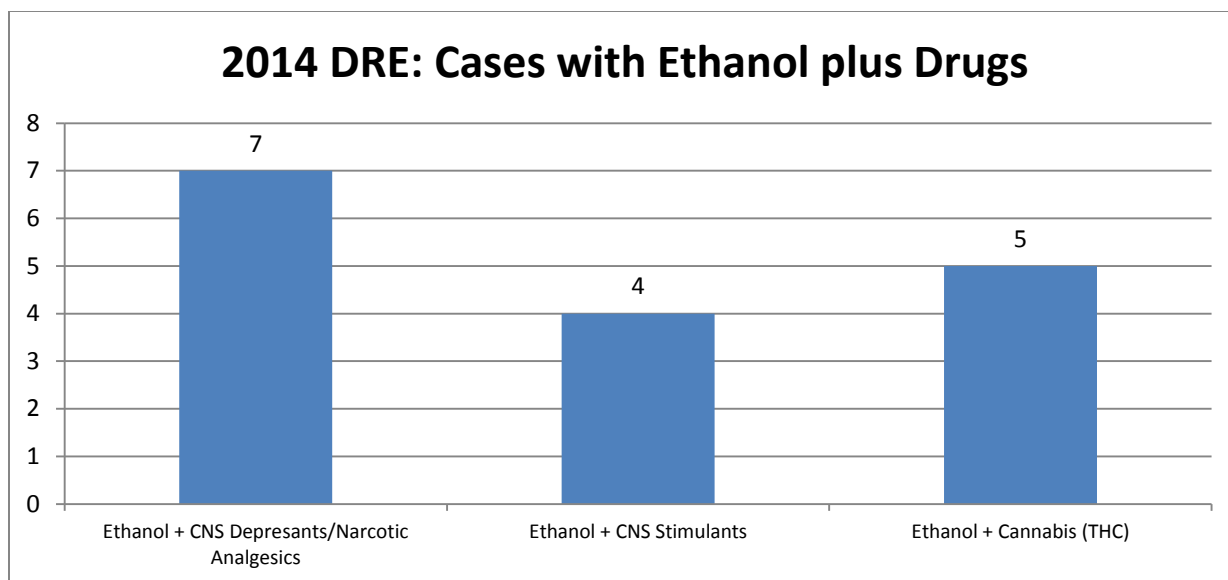
Year	mg/L	FLUOXETINE	MEPROBAMATE	QUETIAPINE	TRAZODONE	VENLAFAXINE
2010	Mean	0.21	14	0.11	0.43	0.25
	Range	0.03-0.52	2-36	0.03-0.27	0.06-0.7	0.05-0.52
2011	Mean	0.23	16	0.21	0.34	0.24
	Range	0.03-0.67	2-40	0.03-0.69	0.06-0.73	0.02-0.75
2012	Mean	0.29	15	0.37	0.51	0.14
	Range	0.03-1.2	3-26	0.02-1.2	0.06-1.2	0.03-0.49

2013	Mean	0.19	11	0.36	0.56	0.38
	Range	0.07-0.43	2-28	0.04-1.1	0.12-1.6	0.05-1.4
2014	Mean	0.36	13	0.22	0.57	0.44
	Range	0.91-1.8	2.4-52	0.04-0.85	0.06-1.4	0.58-2

DRE (Drug Recognition Expert) Summary

Note: Some cases may be positive for multiple drugs.





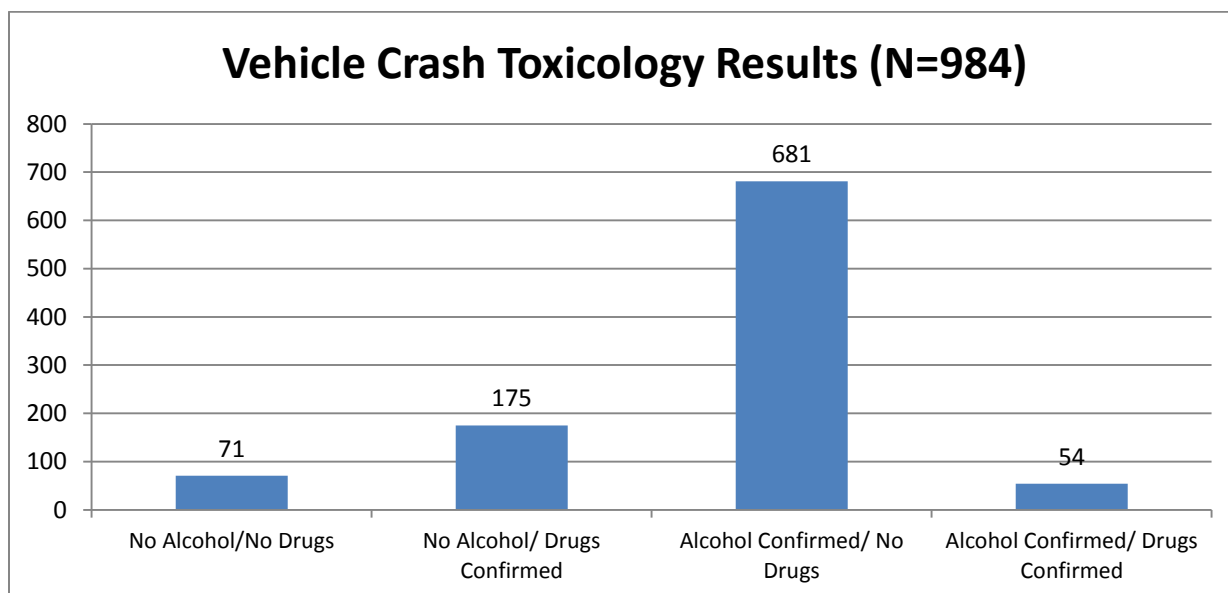
DRE: Cases with Alcohol plus Drugs

The mean alcohol concentration in these cases was 0.07 g/100mL. The mean THC concentration from Cannabis use was 11.8 ng/mL.

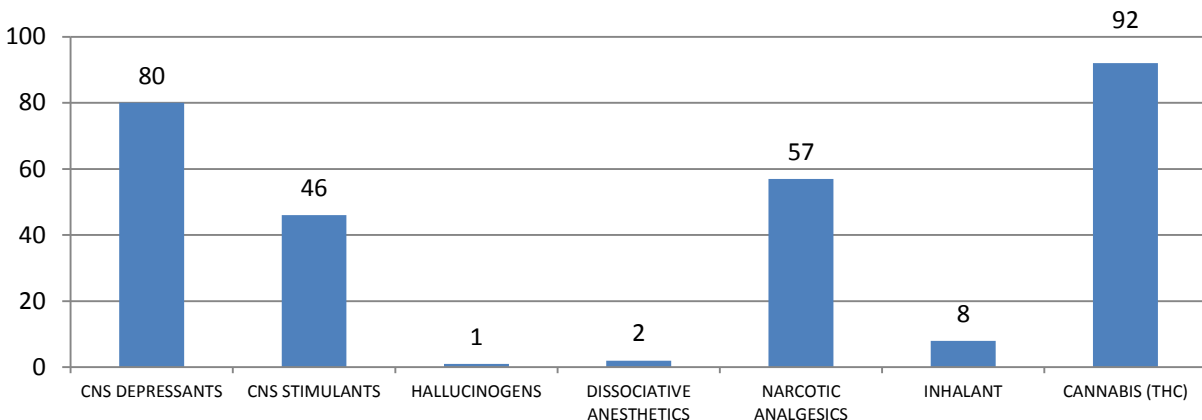
Crash/DUI Summary

Note: Some cases may be positive for multiple drugs.

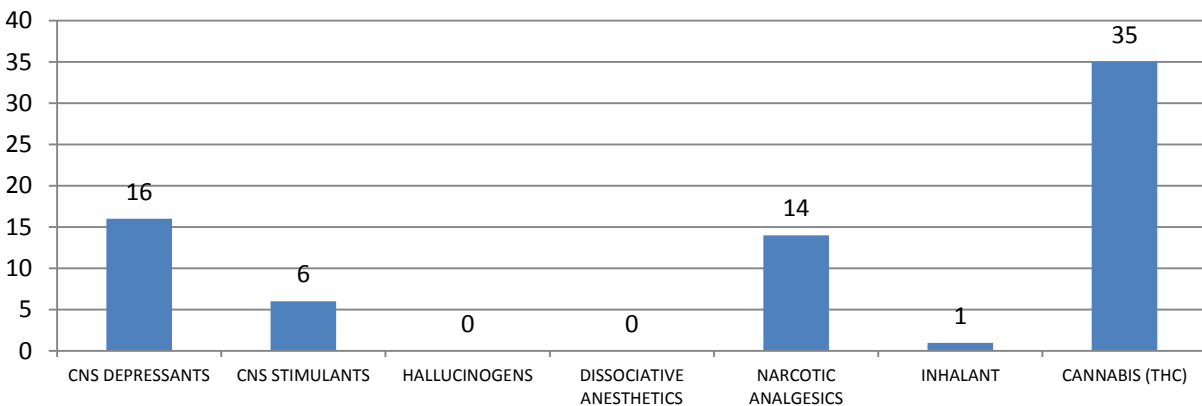
The mean alcohol concentration in the Alcohol Confirmed/No Drug cases was 0.18 g/100mL. The mean alcohol concentration in the Alcohol Confirmed/ Drug confirmed cases was 0.086 g/100mL. The mean THC concentration in the No Alcohol/Drugs confirmed cases was 8.6 ng/mL (N= 92). The mean THC concentration in the Alcohol Confirmed/ Drug confirmed cases was 7.8 ng/mL (N= 35).



Breakdown of No Alcohol/Drugs Confirmed Cases



Breakdown of Alcohol Confirmed/ Drugs Confirmed Cases



Emerging Drugs

Synthetic Cannabinoids

The laboratory currently does not have the capability to perform synthetic cannabinoid testing so any requests are sent to outside reference laboratories. Last year there were 36 such requests. Nine of those cases came back positive (25% positive rate). This low positive rate can be attributed to multiple explanations including the low concentrations found in blood, timeframe of blood draw, among others.

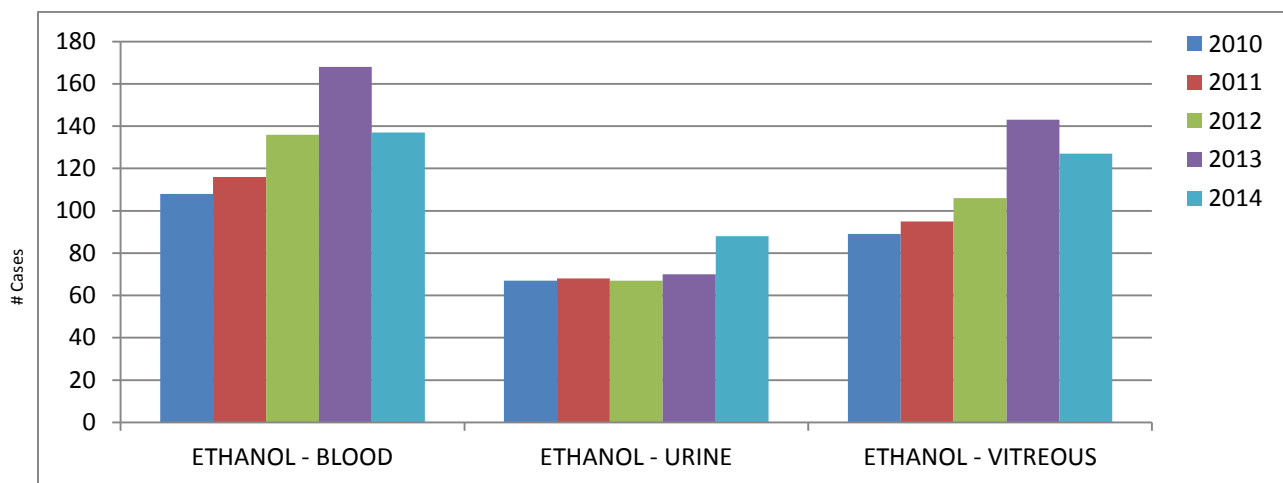
1,1-Difluoroethane

The compound is found in “canned air” and regularly used for huffing. The laboratory confirmed the compound in 17 DUID cases this year.

UNATTENDED DEATH SUMMARY (POSTMORTEM CASES)

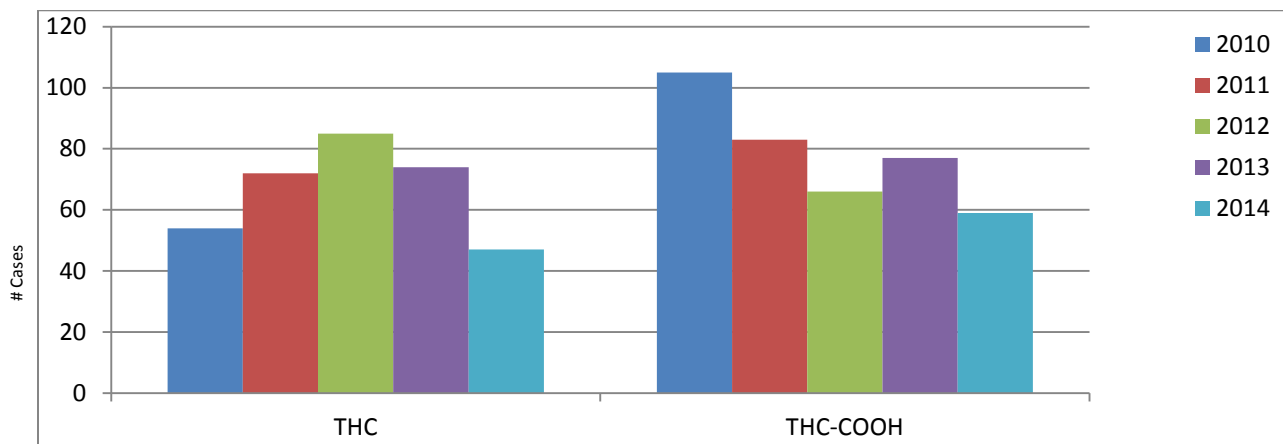
A routine postmortem toxicology testing panel consists of the analysis of major alcohols (ethanol, methanol, acetone, and isopropanol), illicit drugs, and prescription medications. Case history and requests from the submitting agency decides the final testing panel of each case. All positive drug results have been screened and confirmed by different scientific methods. All significant drug results were quantitated unless directed otherwise. The data found in the following tables are only results from the various unattended death cases in our lab and should not be used in any type of postmortem drug interpretation.

Unattended Death- Ethanol



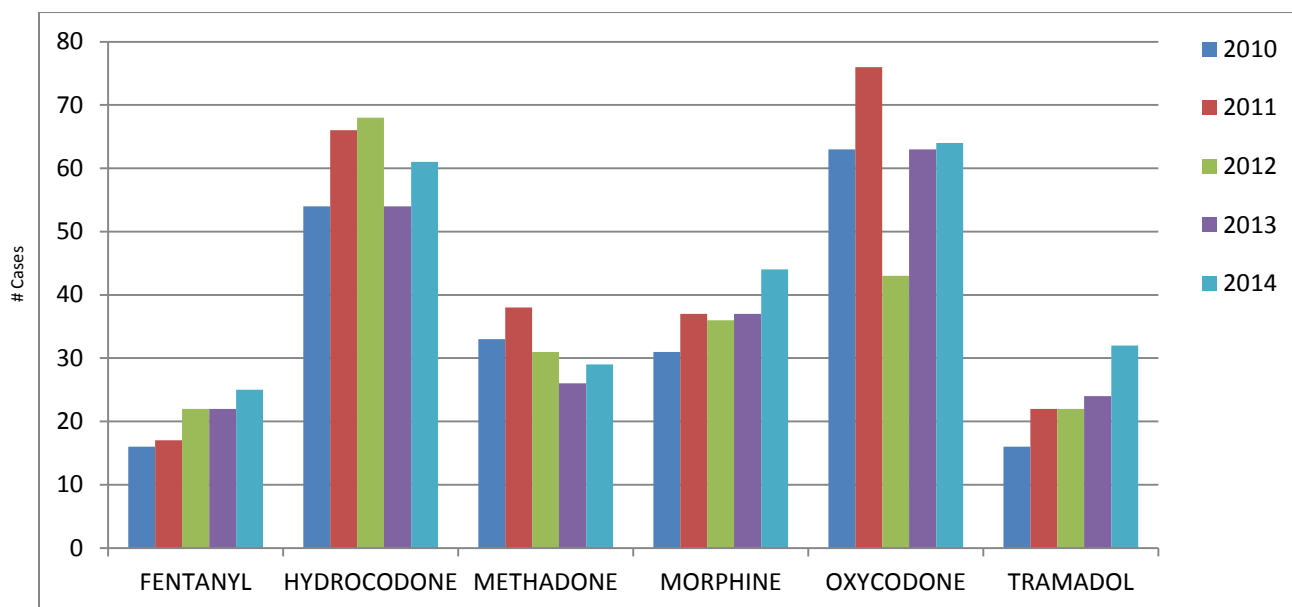
Year	g/100mL	ETHANOL-BLOOD	ETHANOL-URINE	ETHANOL-VITREOUS
2010	Mean	0.17	0.23	0.20
	Range	0.02-0.53	0.03-0.62	0.03-0.88
2011	Mean	0.16	0.24	0.21
	Range	0.02-0.53	0.02-0.50	0.02-0.55
2012	Mean	0.14	0.23	0.19
	Range	0.02-0.41	0.02-0.49	0.02-0.54
2013	Mean	0.17	0.22	0.20
	Range	0.02-0.50	.02-0.55	0.03-0.53
2014	Mean	0.17	0.24	0.20
	Range	0.02-0.45	0.02-0.50	0.02-0.50

Unattended Death- THC



Year	ng/mL	THC
2010	Mean	11
	Range	2-50
2011	Mean	7
	Range	1-44
2012	Mean	7
	Range	1-39
2013	Mean	9
	Range	1-70
2014	Mean	11
	Range	1-62

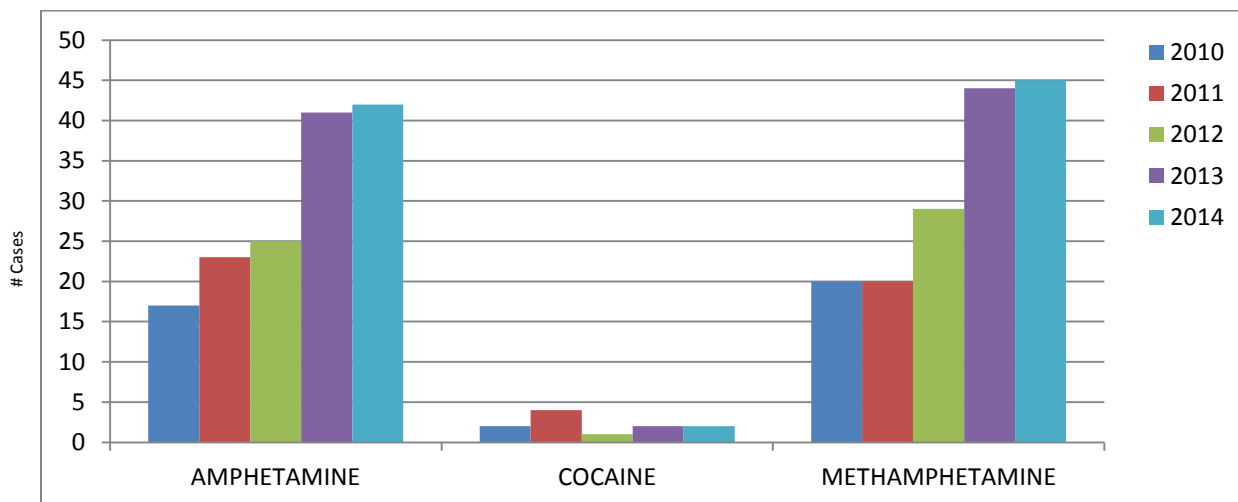
Unattended Death- Narcotic Analgesics



Year	ng/mL	FENTANYL	HYDROCODONE	METHADONE	MORPHINE	OXYCODONE	TRAMADOL
2010	Mean	19	0.15	0.49	0.10	0.35	11
	Range	5-42	0.02-0.67	0.03-1.6	0.02-0.39	0.03-1.1	0.04-82
2011	Mean	23	0.10	0.61	0.22	0.45	2.1
	Range	6-80	0.02-0.26	0.07-1.6	0.02-2.3	0.02-2.9	0.03-4.1
2012	Mean	18	0.15	0.56	0.25	0.47	1.1
	Range	3-35	0.02-0.82	0.11-1.9	0.03-2.7	0.02-2.6	0.04-5.4
2013	Mean	15	0.21	0.45	0.25	0.31	2.7
	Range	4-29	0.03-1.0	0.02-1.1	0.02-2.5	0.03-1.9	0.04-24
2014	Mean	12	0.17	0.40	0.28	0.28	2.1
	Range	1-48	0.02-2.2	0.07-1.2	0.02-3.6	0.02-2.2	0.1-12.5

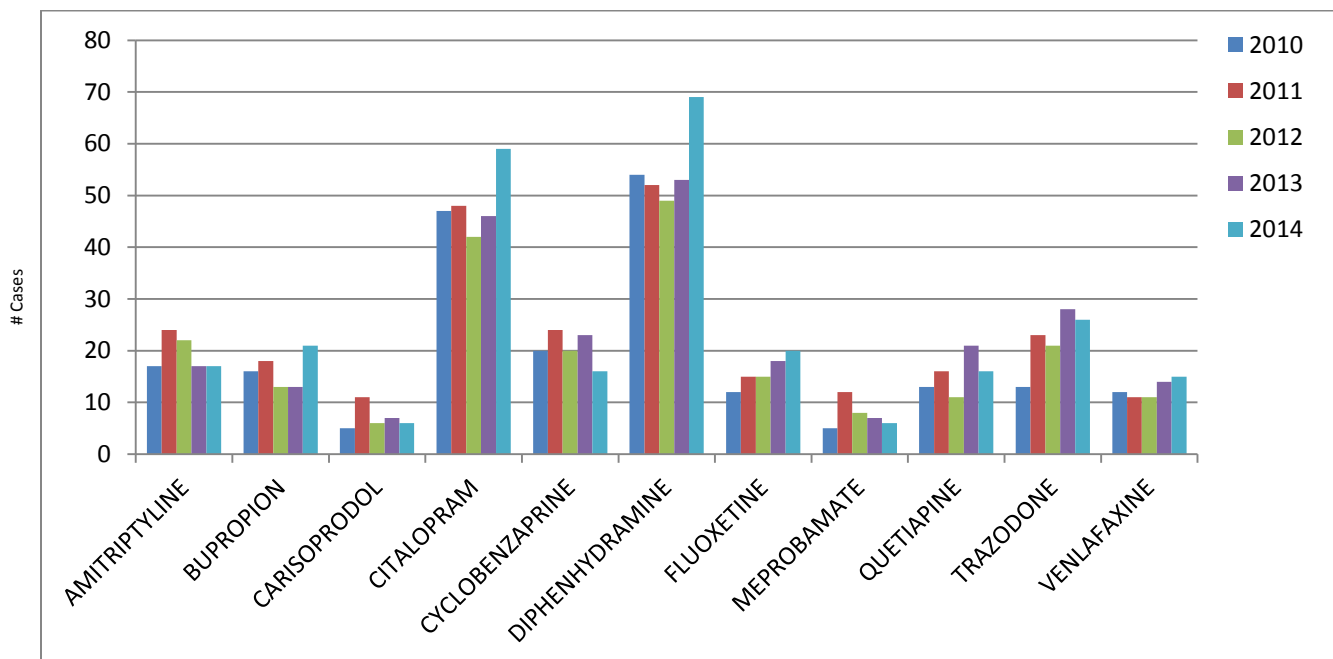
*All concentrations are in mg/L except Fentanyl which is in ng/mL

Unattended Death- Central Nervous System Stimulants



Year	mg/L	AMPHETAMINE	COCAINE	METHAMPHETAMINE
2010	Mean	0.14	0.06	1.2
	Range	0.03-0.27	0.03-0.08	0.03-8.5
2011	Mean	0.14	0.07	0.34
	Range	0.04-0.36	0.04-0.1	0.06-0.91
2012	Mean	0.18	NA	0.56
	Range	0.02-1.2	NA	0.12-1.9
2013	Mean	0.16	NA	0.91
	Range	0.02-1.2	NA	0.14-10.7
2014	Mean	0.15	NA	1.8
	Range	0.02-1.2	NA	0.04-17

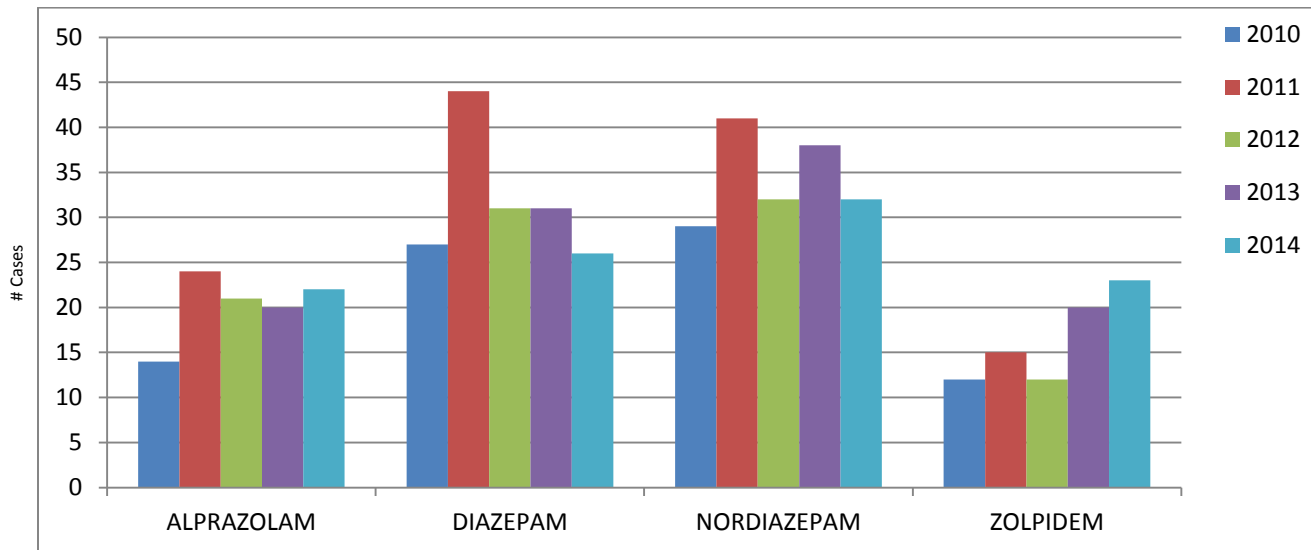
Unattended Deaths- Central Nervous System Depressants



Year	mg/L	AMITRIPTYLENE	BUPROPION	CARISOPRODOL	CITALOPRAM	CYCLOBENZAPRINE
2010	Mean	2.3	0.43	2.8	1.6	0.13
	Range	0.31-9.3	0.03-2.6	0.4-8.9	0.03-18	0.02-0.5
2011	Mean	0.72	0.37	7.9	0.50	0.14
	Range	0.07-4.0	0.03-1.2	3.7-18	0.04-1.3	0.02-0.46
2012	Mean	0.46	0.21	0.76	0.59	0.11
	Range	0.08-1.9	0.08-0.41	0.3-1.4	0.06-2.9	0.05-0.3
2013	Mean	0.64	1.3	7.9	0.49	0.13
	Range	0.03-2.3	0.03-9.4	0.3-35	0.05-2.1	0.03-0.67
2014	Mean	0.51	0.44	3	1.4	0.12
	Range	0.04-2	0.05-1.5	1-6.6	0.03-20	0.06-0.26

Year	mg/L	DIPHENHYDRAMINE	FLUOXETINE	MEPROBAMATE	QUETIAPINE	TRAZODONE	VENLAFAXINE
2010	Mean	3.1	3.0	5.0	1.3	1.2	0.80
	Range	0.04-46	0.26-21	1.1-16	0.12-4.5	0.28-5.9	0.04-3.5
2011	Mean	0.80	0.97	14.4	0.71	1.7	1.9
	Range	0.04-6.1	0.2-3.2	1.0-38	0.08-4.1	0.2-20	0.21-12
2012	Mean	1.7	0.87	3.3	0.91	0.94	0.65
	Range	0.07-19	0.23-1.8	1.7-6.7	0.21-2.8	0.06-2.1	0.1-1.3
2013	Mean	1.3	0.95	9.8	2.3	0.96	1.3
	Range	0.04-24	0.3-3.8	2.4-31	0.13-11	0.07-9.7	0.1-5.6
2014	Mean	0.54	0.63	9.2	1.7	0.52	0.85
	Range	0.03-6	0.03-2.1	4.0-23	0.01-8.8	0.04-2.6	0.08-4.1

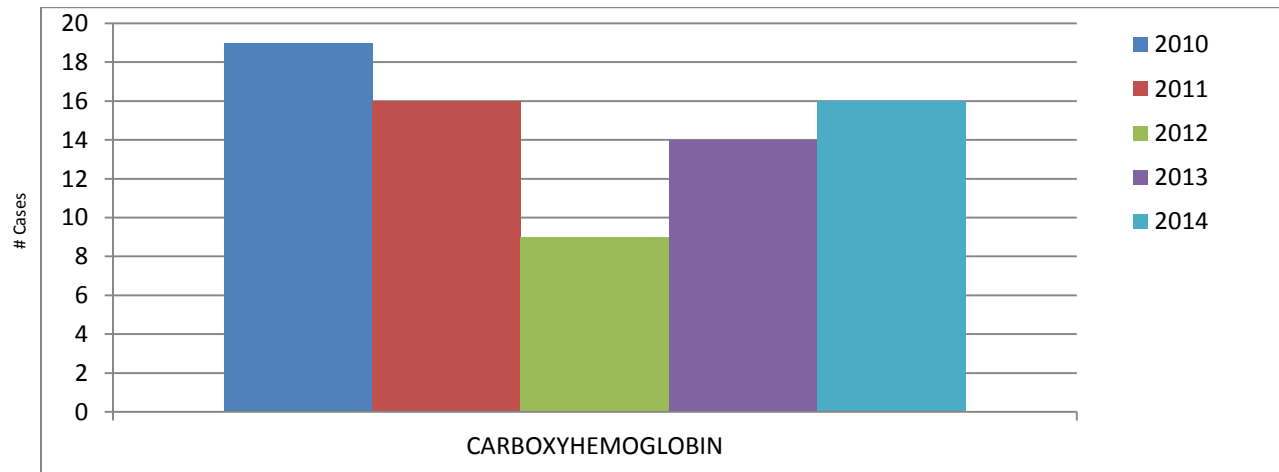
Unattended Deaths- Central Nervous System Depressants (Benzodiazepines)



Year	mg/L	ALPRAZOLAM	DIAZEPAM	NORDIAZEPAM	ZOLPIDEM
2010	Mean	0.10	0.24	0.31	0.47
	Range	0.02-0.34	0.02-0.98	0.02-1.6	0.05-2.2
2011	Mean	0.07	0.18	0.26	0.39
	Range	0.03-0.17	0.02-0.73	0.02-1.0	0.03-1.9
2012	Mean	0.07	0.18	0.19	0.15
	Range	0.02-0.17	0.02-0.75	0.02-0.84	0.03-0.57
2013	Mean	0.08	0.13	0.19	0.15
	Range	0.02-0.40	0.02-0.34	0.03-0.52	0.04-0.57

2014	Mean	0.04	0.18	0.21	0.1
	Range	0.02-0.08	0.02-0.61	0.02-0.96	0.02-0.38

Unattended Death- Carboxyhemoglobin

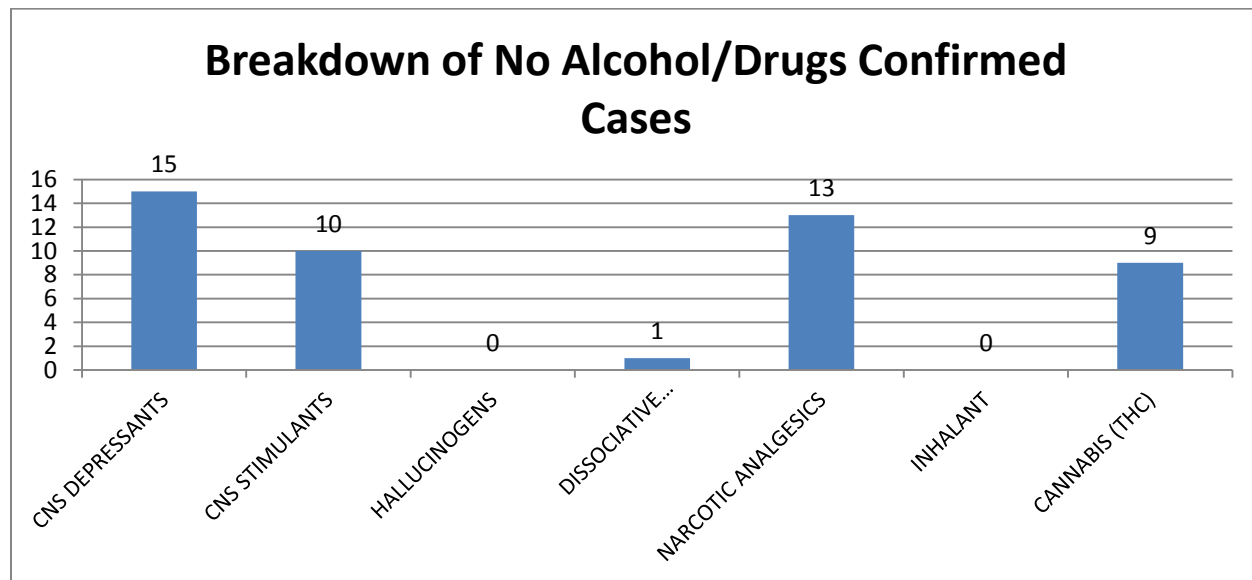
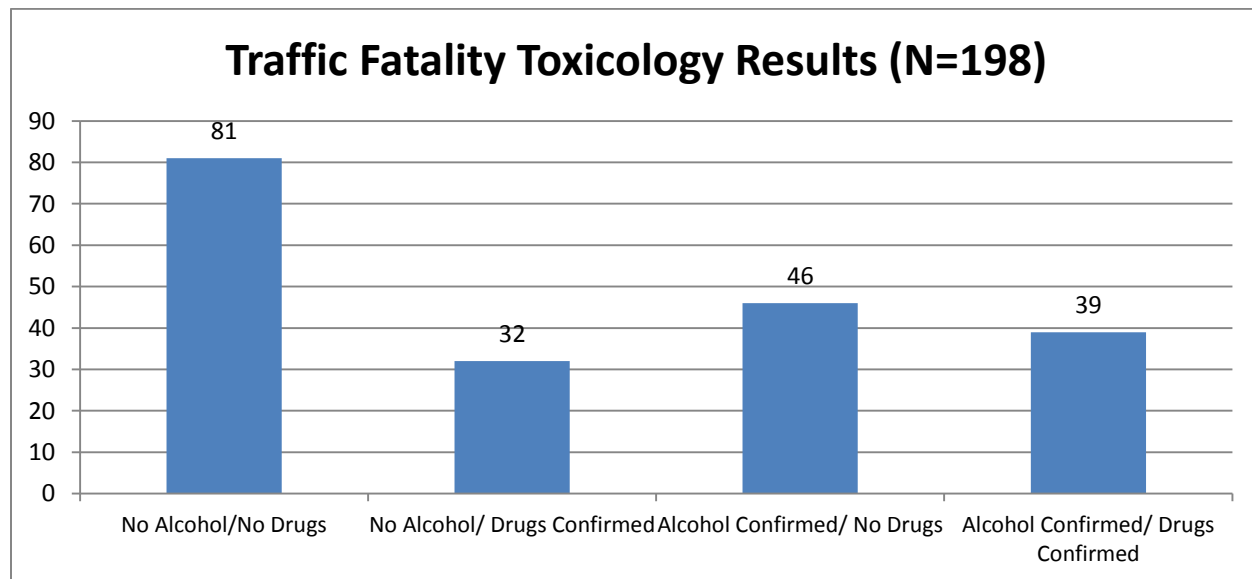


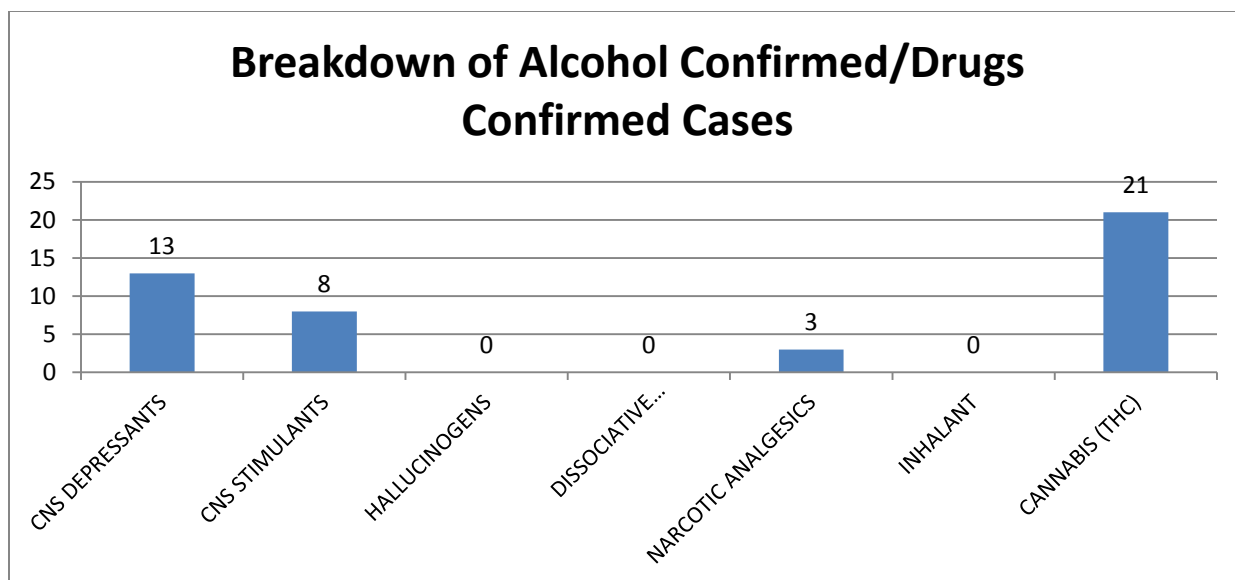
Year	%COHB	CARBOXYHEMOGLOBIN
2010	Mean	43%
	Range	0-77%
2011	Mean	42%
	Range	0-92%
2012	Mean	39%
	Range	0-79%
2013	Mean	34%
	Range	0-70%
2014	Mean	42%
	Range	1-75%

TRAFFIC FATALITIES SUMMARY

Note: Some cases may be positive for multiple drugs.

The mean alcohol concentration in the Alcohol Confirmed/No Drug cases was 0.19 g/100mL. The mean alcohol concentration in the Alcohol Confirmed/ Drug confirmed cases was 0.18 g/100mL. The mean THC concentration in the No Alcohol/Drugs confirmed cases was 14 ng/mL (N=9). The mean THC concentration in the Alcohol Confirmed/ Drug confirmed cases was 13 ng/mL (N= 21).



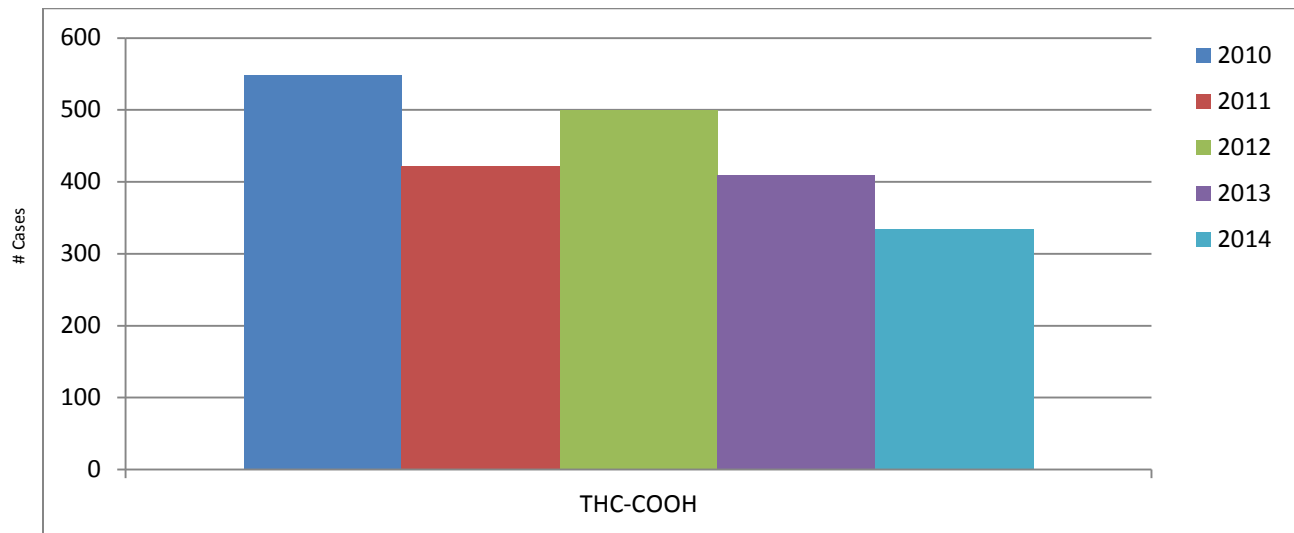


URINALYSIS SUMMARY

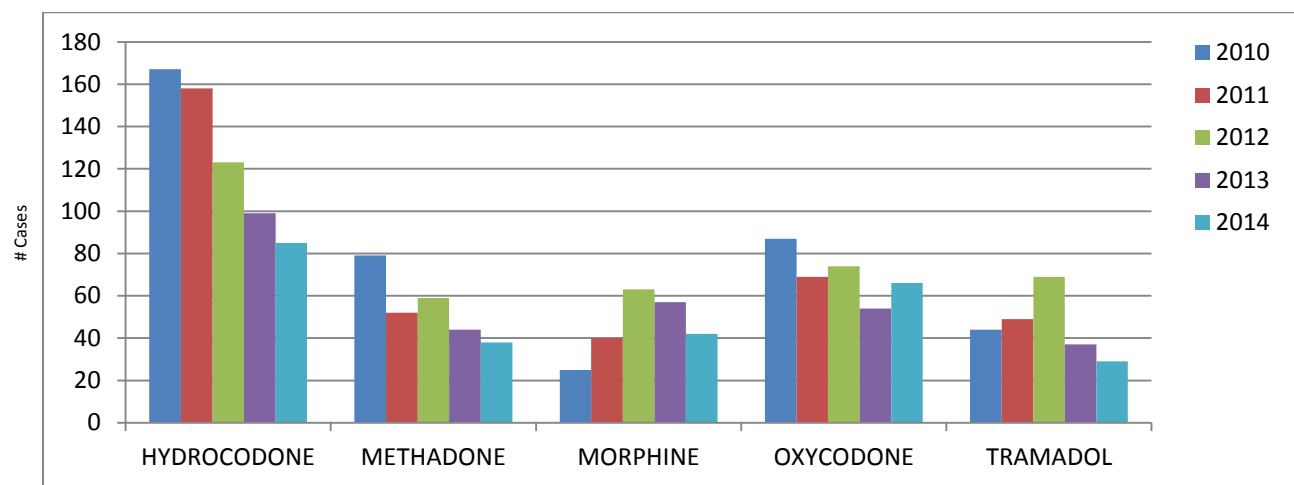
Our policy is to confirm the drugs that are requested on the submission form. The following list contains the drugs regularly tested for in Urinalysis cases. This is not a complete list but the majority of drugs probation/parole agencies are interested in are included. There can be overlap between the Immunoassay and the Basic Drug Screen depending on the drug. This list will only include some of that overlap. Clearly the detection of all drugs is concentration dependent. There is no quantitation on urine specimens. Of the 1250 urine specimens that were submitted for analysis, 221 (17.7%) were reported out as no drugs detected.

1. Immunoassay Screen (Further testing needed for confirmation)
 - a. Cocaine/Metabolites
 - b. Benzodiazepines
 - c. Barbiturates
 - d. Opiates (Morphine)
 - e. Oxycodone
 - f. THC/Metabolites
 - g. Amphetamine
 - h. Methamphetamine
2. Full Scan Basic Drug Screen (GC/MS or LC/MS)
 - a. Opiate related drugs: Methadone/ Tramadol/ Hydrocodone/ Fentanyl/ Oxycodone
 - b. Cocaine
 - c. Benzodiazepines
 - d. Amphetamine
 - e. Methamphetamine
 - f. Anti-depressants
3. Ethanol
4. THC-COOH Confirmation (Inactive metabolite of THC)

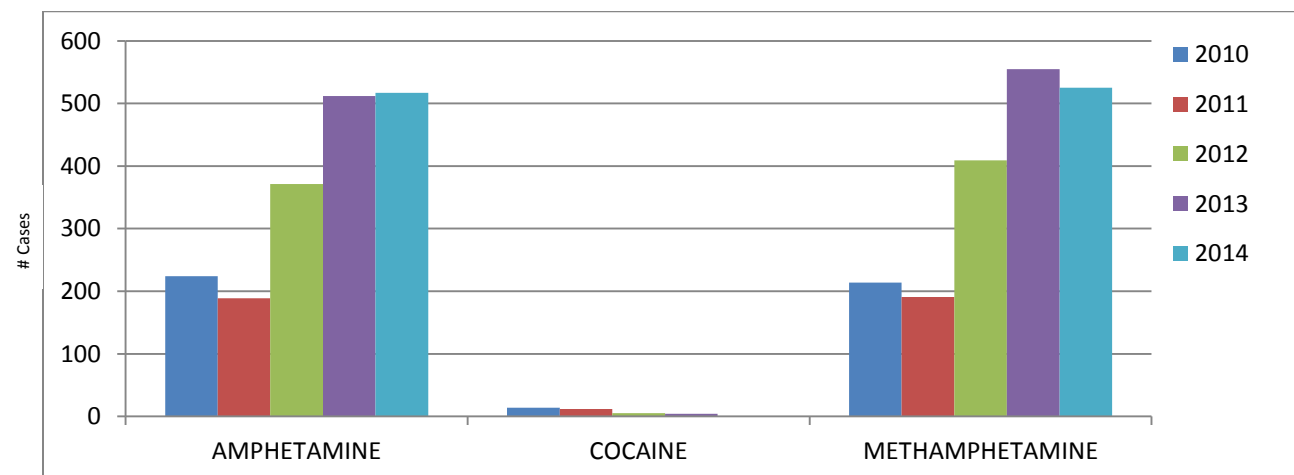
Urinalysis- THC-COOH



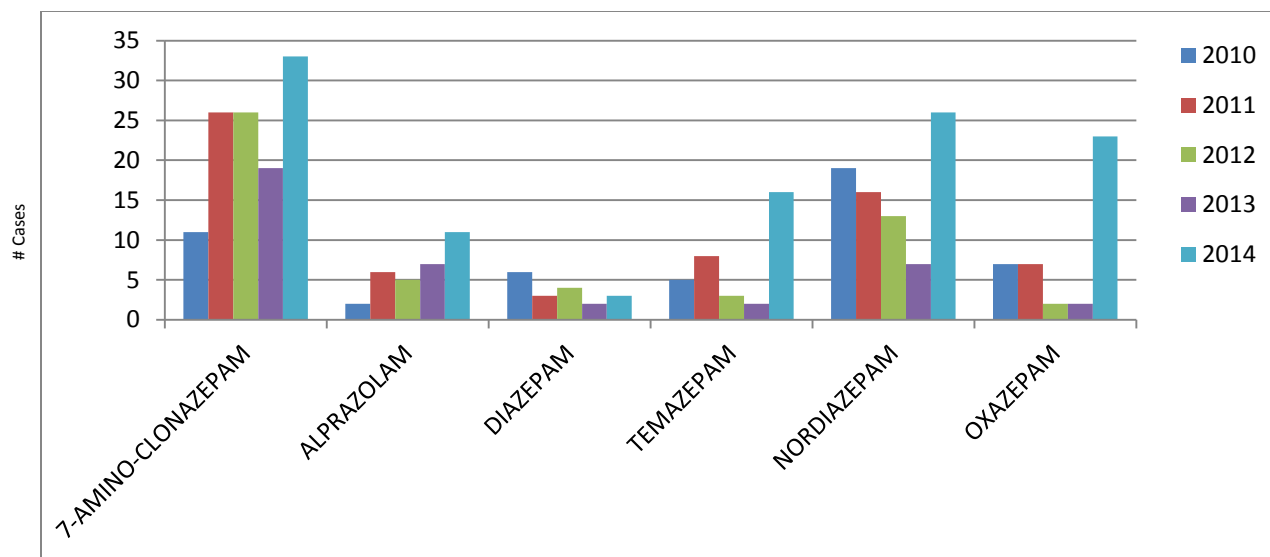
Urinalysis- Narcotic Analgesic



Urinalysis- Central Nervous System Stimulants



Urinalysis- Central Nervous System (Benzodiazepines)



DRUG ENDANGERED CHILDREN (DEC) SUMMARY

DEC cases are submitted from multiple agencies throughout the state. The specimens that are routinely submitted are urine and/or hair. The laboratory performs drug testing on all urine specimens while forwarding all hair specimens to an outside lab. Last year 23 hair specimens were sent out. No drugs were detected in 11 cases, cannabinoids (marijuana) was detected in 7 cases, amphetamine/methamphetamine was detected in 6 cases, and cocaine was found in 1 case. Some cases had multiple positives.

BREATH ALCOHOL SUMMARY

The Breath Alcohol section was created in the late 1980's by Phil Lively, who implemented the state wide use of the Intoxilyzer infrared breath analysis instrument. The section now oversees nearly 100 instruments in the field and has almost 2000 certified officers throughout the state. In a typical year those officers run approximately 20,000 breath tests. More accurate state and local testing statistics aren't available with the current instrumentation and software, but could be attained by acquiring a newer version of the instrument and its accompanying software. The laboratory is currently working to acquire this updated model due to the age of its current instrumentation.

The section has three main duties that are performed on a regular basis. The first duty includes the maintenance, repair, and calibration of all breath analysis instruments. These instruments are supplied to law enforcement agencies around the state comprising of local, county, state and federal locations. Montana Administrative Rules require all instruments to be returned to the laboratory at least once a year for this process. The annual certification returns the instruments to above factory standards using the most modern forensic techniques available.

The second duty of the Breath Alcohol section involves the training and recertification of all law enforcement officers. As part of the Montana Law Enforcement Academy, all officers are required to

pass a comprehensive 40-hour course in DUI detection, arrest and processing. Officers are from all types of law enforcement agencies, including local, county, state and federal. This course includes basic alcohol pharmacodynamics and pharmacokinetics, breath analysis instrument infrared theory and operation; in combination with Standardized Field Sobriety Testing (SFST). All students are exposed to live alcohol dosed individuals for 'real world' hands-on training and must pass a written and practical test. This course typically has nearly 50 students and is run at least 5 times a year. After achieving this level of certification, all officers are also required to perform a recertification each year in order to maintain their DUI certification status.

The final duty involves the education of breath alcohol testing to various groups throughout the state. The breath alcohol section is involved with training prosecutors, defense attorneys, and judges in this field. Between 3 and 5 trainings a year to legal professionals are performed through courses set up by the Traffic Safety Recourse Prosecutor. In addition, the section testifies in court, for both prosecution and defense, roughly 50 times per year in all jurisdictions (city, justice, district and federal courts) across Montana.